Innovative SBR Antenna Technology

Flight Demonstration System

FACT SHEET Air Force Research Laboratory Space Vehicles Directorate 505.846.4704/4321 www.vs.afrl.af.mil

The Defense Advanced Research Project Agency (DARPA) Innovative SBR Antenna Technology (ISAT) Flight Demonstration System (FDS) utilizes advanced deployable aperture technology for precision tracking of tactical-grade ground moving target indicators (GMTIs) from medium earth orbit (MEO). The mission demonstrates the key technologies that support the ability to perform space based radar (SBR) missions from MEO:

- Reliable deployment and control of an extremely long truss/ antenna capable of being stowed in a single EELV faring, and
- Calibration, particularly on transmit, of a long flexible active antenna.

The spacecraft consists of a low risk spacecraft bus combined with an approximately 100m x 3m x 3m triangular truss structure sparsely populated with electronically steerable array (ESA) transmit panels which form an antenna. This antenna truss structure must be densely packaged to fit into a 4m launch vehicle fairing and will be deployed immediately following initialization and on-orbit check-out. A precision metrology system will measure on-orbit relative position and dynamic effects of the panels. The truss structure will be calibrated to provide real-time information of the position of the radar transmit panels to mm tolerances to precisely generate a coherent X-band beam from a flexible 100m structure. Since the radar panels are transmit only, the waveforms are measured at special ground stations and then processed in real-time and archived. Parameters resulting from this ground processing are fed back to the spacecraft via the Air Force Satellite Control Network (AFSCN) in real-time.

The vehicle payload modifies its waveforms according to these parameters in the same orbital pass and transmits another series of waveforms to the same ground stations to verify the quality of the waveform data and to iterate until the desired coherence and beam quality is achieved at target locations. Characterization of both the structural response and X-band RF transfer functions under various solar beta angles and transition thermal heating will be performed during the year of on-orbit experiments.

The ISAT Flight Demonstration objectives will be accomplished over 12 months of LEO operations. Formal experiment criteria will define the spacecraft, environmental, and target conditions for execution of an experiment and what performance data constitutes successful completion of the experiment. These on-orbit experiments will be complemented by extensive ground testing to build structural and radar performance models that will be refined and validated by the on-orbit experiment data. The spacecraft is being sized as the primary payload on a 4m Evolved Expendable Launch Vehicle (EELV) with a fully loaded EELV Secondary Payload Adaptor (ESPA) ring. The spacecraft is currently scheduled to launch in FY10.

Current as of February 2005